

## HAULAGE ON TRAMLINE SYSTEMS

(Read by Mr. H. E. H. PALAIRET.)

There are three main methods of haulage of tram trucks, each one being suited to particular conditions. The following gives a general indication as to the circumstances under which each system is most likely to prove suitable. The costs quoted are the results of actual experience.

On a main line system over which large tonnages are hauled, the larger steam locomotives are probably the most economical and efficient. An example may be cited of a large system where each 15-ton locomotive delivers 230,000 ton miles each season, hauling some 120 tons about ten miles each day. The costs of this, reduced to a basis of one ton over five miles, are:—Fuel and oil 1·02d., loco. maintenance and depreciation 2·08d., trains crew 0·94d., and track maintenance 7d., making a total cost for an average haul of 5 miles of 11d.

For smaller tonnages, a lighter track is desired and would justify the use of an 8-ton Diesel locomotive on 20-lb. rails, costing for fuel and oil 1·49d., loco. maintenance and depreciation 4·60d., trains crew 2·87d., and track maintenance 4·80d., totalling for a 5-mile haul 13·76d.

For temporary lines tractor haulage on 16-lb. rails should be considered, as in a case where a 30 h.p. crawler tractor delivered 13,282 ton miles in a season, hauling some 109·6 tons about 5·09 miles each day. Reduced to the same basis this showed a cost for fuel and oil 4·11d., tractor maintenance and depreciation 5·59d., tractor's crew 1·45d., and track maintenance 3·48d., making a total of 14·63d. This system has the advantage that the tractor can be used for other purposes when not required for cane haulage.

VERNON CROOKES.  
VICTOR CROOKES.  
H. L. GARLAND.  
R. OLIVIER.  
G. S. JOHNSON.  
H. E. H. PALAIRET, *Convenor.*  
*Field Tramline Committee.*

a new thing here, we had one set of figures in which the locomotive was not virtually in full time use. I understand it was about two-thirds working capacity, which means that figure for the trains crew would probably be lower when it is working its full capacity. All the others are based virtually on full capacity use, which means the figures for the small Diesel would be slightly more favourable probably. We have no figures for an 8-ton steam locomotive to compare with the Diesel. We have simply had to get indications with the figures we had available. If some system of getting more extensive figures from other accounts were available, it is probable that some very useful information could be distributed. But the Committee have given you figures from the records they had available, as an indication of what might be done and should be considered. (Applause.)

CHAIRMAN: This Committee has certainly put up a record paper for size! But I am sure you will find quite a lot of substance for discussion.

Mr. VERNON CROOKES: I am a member of this Committee, and we decided to leave out the depreciation of the line and the cost because it was a figure which varied tremendously. Take, for argument's sake, the construction of a line in Zululand, the rails used, and compare that with the cost, say, down the South Coast. It would be practically three times the cost. So these figures do not include either the depreciation or the construction of the line.

SECRETARY: I understand that the figures simply represent bare working costs, without any allowance for fixed charges and overheads.

Mr. WATSON: I cannot quite understand why the cost of the train crew under steam should be so very much less than the cost of the crew under the Diesel engine. We have got here 0·94d. under steam and 2·87d. under Diesel traction. That is on the same basis of five miles run, I take it. It seems to me to be a little bit out of proportion. I took it that a Diesel engine required a driver only, whereas with a steam engine you have to have a boy to shovel coal and look to your water and so on. Normally speaking, a train crew for the Diesel should be less than a steam one.

Mr. PALAIRET continued: We brought the cost down to a basis of 5 miles, that being a fairly average length which Planters' Associations or Planters might have to consider. Big estates, of course, have the long runs, where probably the steam locomotive would have it unquestionably. With regard to the figures, I would like to mention one point, which probably has been spotted already. The trains crew, which consists of driver, fireman and brake boys, all have to go with your track. In the case of the Diesel locomotive, you will see that reads very high. The Diesel locomotive being

Mr. PALAIRET: I am sorry I forgot to bring with me the figures which were produced at that Committee. If Mr. Johnson were here, he would be able to give the figure for the average tons hauled by one locomotive in a day. Mr. Crookes could probably give the average ton miles hauled by the small Diesel in a day. As I pointed out, that Diesel is only working two-thirds capacity. It would have been wiser, perhaps, if we had brought the figures from which we obtained this information. But the heavier steam locomotive hauls such a very large tonnage of cane in the day, it is not a fair comparison as it stands at present. This

paper is really to show the possibility of making a study of these things. The main difference between the two is the tons hauled per day.

Mr. ASKEW: But you don't show the tonnage hauled. I do not think these figures give us very much to go on unless we find on what tonnage they are based.

Mr. VERNON CROOKES: The Diesel locomotive carried about 27,000 tons for the season, and the big steam locomotive was approximately 75,000 tons.

Mr. WATSON: I think that the basis of the calculation should be on the h.p. of the engine. If we are going to compare these figures, we should have the h.p. of the steam engine as against the Diesel engine. If you are running an 80 h.p. engine on a train you have one driver, and you must have three brake boys. You can come down to 45 h.p. and still have the driver and three brake boys. So that the train crew costs practically the same in both instances, but in one you are running 80 h.p. and the other 45 h.p. Therefore the driver and crew ought to be able to do twice the work and come out at half the cost as in the other.

Mr. ASKEW: I think everything depends on the tonnage. It seems to me that if you take 40,000 tons as a basis, then see the cost of 50,000 tons. I do not think these figures elucidate the matter sufficiently.

Mr. WATSON: As Mr. Crookes has pointed out, the one installation was only used part of the time. The steam engine was doing full capacity, and the other was not. If you take it on h.p. and come back to an eight-hour shift, then we can come down to comparable figures as to running the two systems.

Mr. ASKEW: Would you not refer this report back to the Committee and ask them to make up another report for next year? (Laughter.)

Mr. PALAIRET: I am afraid I am in a very difficult position, because although I have had a fairly considerable engineering training I am very diffident, as

an amateur, in definitely and utterly opposing the contention of a qualified engineer. There is one thing in locomotive work—your drawbar hauls two things and two things only, weight and friction. At the speeds possible with cane haulage, the drawbar pull is a product of weight on driving wheels and coefficient of friction. Any modern locomotive develops this much tractive force; therefore the true comparison between locomotives is "weight on driving wheels." Locomotive design generally provided sufficient power, so that friction is your danger. You have to study the point of friction. The one point in the design of the tramline is the ruling grade. The ruling grade, to put it into simple language, is power of haul. It may be the grade on the straight, it may be the grade on the curve, but the ruling grade on the line is the actual tonnage you can haul. Where you get a big system it pays you to spend considerable sums in earthworks to get a general ruling grade; therefore your steam locomotive has a general ruling grade. The one locomotive can haul a larger tonnage. Where you get a light plant, that big expenditure of capital is not so justified. Your ruling grade is steeper, the actual tonnage of your train is less, therefore the actual cane you haul in one trip is less, and all that has to be considered by the surveyor in planning out your line.

Mr. VERNON CROOKES: I have been asked to give an idea of the Diesel articulated locomotive so far as friction is possible. There is not the friction with the Diesel articulated locomotive that you have with steam. She has a better grip on the rails and she can carry a better tonnage behind her on a curve than a steam locomotive can. She has not the thrust, she has one general beat like a car, and she sticks to the rails without a skid, and therefore she can carry a better weight behind than the steam locomotive in comparison with h.p. The smaller h.p. Diesel can do what a stronger steam locomotive can on a curve. I pull up 25 tons cane with the Diesel locomotive up a grade of 1 in 40. That is not taking in the weight of any trucks. I do not think any steam locomotive could do it.